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with these knives, just above the ears, and the whole scalp jerked off. These were then rapidly smoked over a fire kindled in a small round hole, and borne off in triumph towards home, together with the arms and legs, suspended upon spears." Upon arriving at home they suspended these mangled limbs and trophies and danced around them in honor of their victory. Again, in arranging the Wilkes collection for the National Museum, I was struck with the great number of spear-points made of human bones. The question occurred to me then, and has been revived by Prof. Wyman, whether any magical effect would be attributed to spear-points made of the bones of a brave enemy. The absence of pointed bone in Omori would, of course, exclude the spear-point or implement theory. In conclusion, we consider Prof. Morse's memoir one of the most important contributions to archæology for the year 1879.

Numbers 3, 4 and 5 of *Materiaux* contain the following papers of interest to general students: Les pierres a bassin et les rochers a écuellés dans la Lozère, by G. de Malafosse; A Review of Evans' Ancient Stone Implement in Great Britain; Palæo-ethnological bibliography for the year 1878, by L. Pigorini; The Tenevières of the Swiss lakes, by Dr. Forel; The latest archæological publications in the North, the Archæological Society of Finland, by E. Beauvois; Upon the origin of domestic animals, by G. De Mortilet; New anthropological publications in the German language; Study upon ring-money and its use among the Germans, by Dr. Much. The article by Dr. Forel upon the *Tenevières* of the Swiss lakes is a very important one indeed. In M. Desor's classic work upon the palafittes of Lake Neuchâtel, the author describes certain little submerged stone mounds, formed, apparently, by heaping rocks around the bases of piles. When the lakes subside, the mounds form true islets. Dr. Forel's article is to show that many of these are of geological formation, being the natural consequence of a talus forming at the foot of a bluff.

GEOLOGY AND PALÆONTOLOGY.

THICKNESS OF THE ICE SHEET ON ITS SOUTHERN EDGE.—At the Saratoga meeting of the American Association for the Advance of Science, Professor J. C. Smock spoke of the surface limits of thickness of the Continental glacier in New Jersey. The existence of a great terminal moraine and a southern limit to the glacial drift in New Jersey and the adjacent States, were pointed out to the author in 1876, by Professor Geo. H. Cook. In that year the southern limit of the glacial drift was traced across the State from South Amboy to a point on the Delaware river, near Belvidere. Details were given of further investigations in tracing this line. The paper considered two questions:—What was the thickness of the ice-sheet along its southern margin; and what

was the rise of its upper slope northward. The terminal moraine represents both materials carried forward under the foot of the glacier, and also the earth and stone carried on its surface and dropped in a confused mass as it melted and retreated northward. These accumulated heaps may in places have equaled in height the greatest thickness of the glacier front, although in general the moraine would fall short of the height of the glacier. As we see it, this terminal moraine raises greatly in height from point to point. It is possible to get at a minimum estimate of the thickness by considering the heights of some of the hills in the moraine. It is safe to conclude that the ice front of the great glacier was from 200 to 400 feet in thickness. A careful exploration of that part of New Jersey, which is north of the terminal moraine, has thus far failed to discover any peaks or crests, which show no marks of a glacier.

WERE THE ICHTHYOSAURS VIVIPAROUS?—This is a question which Prof. Seeley sought to answer in a paper submitted to the Geological Society at a late meeting. From time to time specimens of Ichthyosaurs have been found, with the remains of small saurians preserved inside the body-cavity. Against the supposition that these small ichthyosaurs had been devoured by the larger ones, it may be urged that their state of preservation is markedly different from that of the remains of food, such as the indigested residuum of fish, which are not unfrequently found in the stomach of the Ichthyosaurs. Moreover, the position of the small skeletons in relation to the larger ones, with which they are associated, is tolerably constant, and is such as to strengthen the supposition that the relationship is that of offspring to parent. From these and other considerations, Prof. Seeley concludes that the Ichthyosaurus must have been viviparous.—*Academy*.

MIOCENE FAUNA OF OREGON.—Prof. Cope recently read a paper before the American Philosophical Society, describing additional species from the Truckee Miocene of Oregon. Several of these were Rodentia, one of which was referred to a new genus, under the name of *Pacculus*. Four were *Carnivora*, two *Canidæ* and two *Felidæ*. A new genus *Hyænocyon* was proposed for the *Enhydron basilatus*, with the following dental formula: I. $\frac{3}{3}$; C. $\frac{1}{1}$; Pre-m. $\frac{4}{3}$; M.—. The genus *Merycopater* was shown to be an *Oreodont* with deficient superior incisors. A new genus of *Oreodontidæ* was described under the name *Coloreodon*, with the following characters: A wide diastema in both jaws. I. $\frac{3}{3}$; C. $\frac{1}{1}$; Pre-m. $\frac{2}{4}$; M. $\frac{3}{3}$. Two species were described, a smaller *C. ferox*, and a larger *C. macrocephalus*, both of which have remarkably developed cranial crests. Three new species were added to the suilline division.

PLIOCENE MAN.—Special interest is attached to Prof. J. D. Whitney's recent volume upon the "Auriferous Gravels of the

Sierra Nevada," one of the official reports of the geological survey of California, though issued by the Museum of Comparative Zoölogy, because of the full description of the reported discoveries of man in the Pliocene Tertiary. These gravels are mostly consolidated into rock and are capped by lava, constituting the Table mountains. The original river valley is now completely filled by gravel and lava, so that the stream, driven out of its course, has been compelled to wear its way to depths varying from 1000 to 2000 feet on either side. Hence, the following events must have happened subsequently to the deposition of the human bones and implements in the bottom of the ancient river: (1) deposition of 130 feet of gravel over the human remains; (2) overflow of lava, completely filling up the valley, so that the river must change its course; (3) wearing down of gorges nearly 2,000 feet deep in hard slates on both sides of the lava flow, so as to carve out a flat-topped mountain. Much time must be required for the accomplishment of these results—hundreds of thousands of years, if the wearing of the Niagara gorge be taken for the unit of measurement. As glacial deposits are not known on the flanks of the Sierras, Whitney relies upon the character of the fossils exhumed to determine the age, and decides that the formation was the Pliocene Tertiary, anterior to the glacial drift of the East. The principal fossils are these: *Rhinoceros*, *Elotherium*, *Mastodon americanus* and *M. obscurus*, three species of horse, a wolf, a deer, *Hipparion*, *Auchenia*, etc. These were determined by Dr. Leidy. Lesquereux describes seventeen species of deciduous trees referred to the Pliocene, with suggestions of the Miocene. Various stone implements, including tools, pestles, mortars, platters, spear and arrowheads, are described from thirty different localities in eleven counties. Human bones were found under Table and in Bald mountain. All these facts are detailed with the utmost care, and it would seem to be clearly proved that human bones and implements are found in these gravels, associated with what are universally regarded as the fauna and flora of the Pliocene Tertiary. This is more satisfactory than any of the reported discoveries of human flints in the later Tertiary of Europe. No one would doubt the correctness of Whitney's conclusion if the question did not involve the age of man. Now, is it clear that the California Pliocene was the equivalent of the Eastern American and European Pliocene? There was no true glacial period in the Sierras corresponding to the Great Northern Drift; hence, may not the organisms of the Western Pliocene period have continued to live on till post-glacial times? Two suggestions agree with Whitney's conclusions: (1) the immense time required to excavate the deep cañons would correspond well with careful estimates of the length of the glacial period, and it is clear that man antedated the erosion of these valleys. (2) The cañon-making period in California and over the area of

the Fortieteth Parallel Survey is probably the equivalent of the glacial period of the East. It is so regarded by Clarence King, in his "Report," and was certainly subsequent to the time when the early men flourished.—*N. Y. Independent*.

The preceding abstract suggests the following observations. Some of the vertebrata reported as found with the human remains in the auriferous gravels are obviously out of place, or erroneously determined. Thus, *Elotherium* does not belong to the Pliocene fauna, nor even to the Upper Miocene (Loup Fork), but to the lowest Miocene or Oligocene (White river). *Mastodon obscurus* is Upper Miocene. How they come to be included in the list remains to be explained.

The occurrence of human implements mingled with the Pliocene fauna in Oregon, was asserted in this journal for 1878, p. 125, and some dozen species of vertebrata cited as cotemporaries. A more extended list of the mammalia was given in the Bulletin U. S. Geol. Surv. Terrs., 1879, p. 48; and of the birds in the same for 1878, p. 389. The entire number of vertebrata now determined from this locality in Oregon amounts to twenty-seven.

During the past summer the writer obtained bones of *Mylo-don* from the auriferous gravels of the Klamath river, near Yreka, Cal., from excavations which he personally examined. He also obtained vessels of vesicular basalt which were undoubtedly procured from the same excavations.

The relation of this formation to the European Pliocene is discussed in an essay on the parallelism of the American and European horizons, in Hayden's Bulletin U. S. Geol. Surv. Terrs., 1879, February.—*E. D. Cope*.

GEOGRAPHY AND TRAVELS.¹

HAYDEN'S NEW MAPS OF WYOMING, ETC.—The forthcoming reports of Dr. Hayden's Geological Survey, on the field-work of 1877 and 1878, will contain three topographical atlas sheets, of the same size, and on the same scale (4 miles to an inch) as those in the Colorado atlas. These sheets illustrate portions of Wyoming, Idaho and Utah, each of them covers $2\frac{1}{2}$ degrees of longitude, and $1\frac{1}{4}$ degrees of latitude, and includes an area of about 11,000 square miles.

The south-eastern of the sheets covers the country from longitude 107° to $109^{\circ} 30'$, and from latitude $41^{\circ} 45'$ to 43° . It includes the barren plateaus of the continental divide, north of the Union Pacific R. R. The valleys of the Sweetwater and Wind rivers, and a part of the Wind River range.

The south-western sheet lies directly west of the latter, extending to longitude 112° . It embraces the Green River basin, and, farther westward, a succession of parallel ranges of no great

¹ Edited by ELLIS H. YARNALL, Philadelphia.